

EXHIBIT 13
PP. 90-119

You can use topographical maps, weather satellite image maps, or other geographical image data as overlays. For ideas and examples of overlays, see the Overlay section on Keyhole Community bulletin board (bbs.keyhole.com).

Keyhole Pro/EC users can open multiple overlay placemarks in the viewer and specify the display order for each. Additionally, overlays in PNG format can be modified so that undesirable regions (such as image boundaries) are transparent, letting the underlying imagery show through. For more information on these overlay features, see "[Advanced Overlay Editing](#)" on page 104 of *Keyhole Imagery*.

The overlay image itself must have a North-Top orientation with *simple cylindrical projection*. Simple cylindrical projection (or Plate Carée) is a simple map projection where the meridians and parallels are equidistant, straight parallel lines, with the two sets crossing at right angles. (This format is also known as Lat/Lon WGS84 projection.) However, because we allow a certain amount of modifications to overlay images, you might find that the more common UTM maps work well enough over small areas. If you want a precise overlay of a large region, simple cylindrical projection is required.

Note: The overlay feature is memory intensive. Consequently, images larger than 2000x2000 pixels can reduce the performance of the Keyhole client and other applications currently running on your computer. (To determine the size in pixels of an image, right-click on the image and select Properties from the pop-up menu.) If you are having trouble importing a large image, you can reduce its size using image editing software such as Adobe Photoshop.

Creating an Overlay from a Local Image

The instructions in this section cover how to create an overlay using an image that is saved to your PC or is available from the network. If you want to create an overlay using an image that is stored on the world wide web, see "[Creating an Overlay with a Web Image](#)" below.



Setting Up the Overlay

1. Position the viewer in the location where you want to place the overlay image file.

Tip: Try to position the viewer so that it corresponds in viewing altitude to the overlay. If the overlay is of a detailed view, zoom into the subject area so that you don't have to make large adjustments later.

2. Click on the New button and select Image Overlay from the pop-up menu.

A New Image Overlay dialog appears.

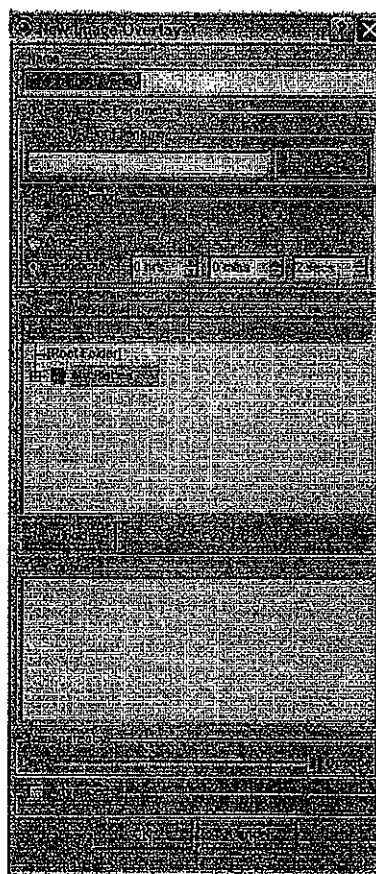
Note: You can also right-click on any folder and select New - Image Overlay from the pop-up menu.

3. Click on the Browse button in the Image File/URL section to insert the image file in the viewer.



Use the file browser dialog to navigate to the file located on your computer's hard drive. To use an image on the World Wide Web, enter the URL for the image file in the text box. For more information, see ["Creating an Overlay with a Web Image"](#) on page 95.

4. Specify the descriptive information for the overlay in the dialog.
Fill in the name and description fields and select the folder for the overlay. You can enter up to 200 characters in the description field, including HTML-formatted characters. If you enter a valid web address in the description field, it will be converted to a link in the resultant description.



5. Set the Refresh Period for the image file.

Use this option to indicate how often the referenced image should be updated. In this way, you can refresh images such as weather maps or web camera data at regular intervals in order to display modified imagery.

Select from the following options to refresh the image.

- **Never**

This option simply loads the image the first time you define the overlay and never refreshes it after that.

- **Once**

This option refreshes the image each time the Keyhole client is started.

- **Periodically**

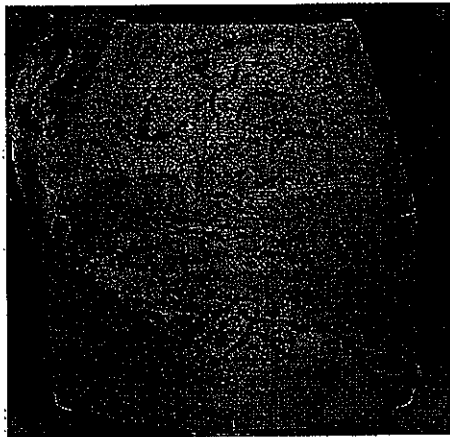
This option refreshes the image at the indicated interval.

6. Set the transparency for the image using the transparency slider.

Depending upon the view you want to have for the overlay, you can adjust the transparency from totally transparent to opaque. Adjusting the transparency is also helpful when initially positioning the image.

7. Set the Placement and View for the transparency and click OK.

The image is inserted proportionally into the viewer, with cross hair, corner and side anchors that you can use to position and adjust the image. See "Positioning the Image" on page 93.



Positioning the Image

Once you have inserted the overlay image into the viewer, you can use the green markers to stretch and move the image in a number of ways to get the most exact positioning required. An overlay image will have corner and edge marks as well as a central cross hair marker that you can click on to position and stretch the image. When you select a marker, the cursor changes to a hand or an arrow to indicate that an anchor point is selected.

The following table describes the ways you can use these marks to position an overlay image.

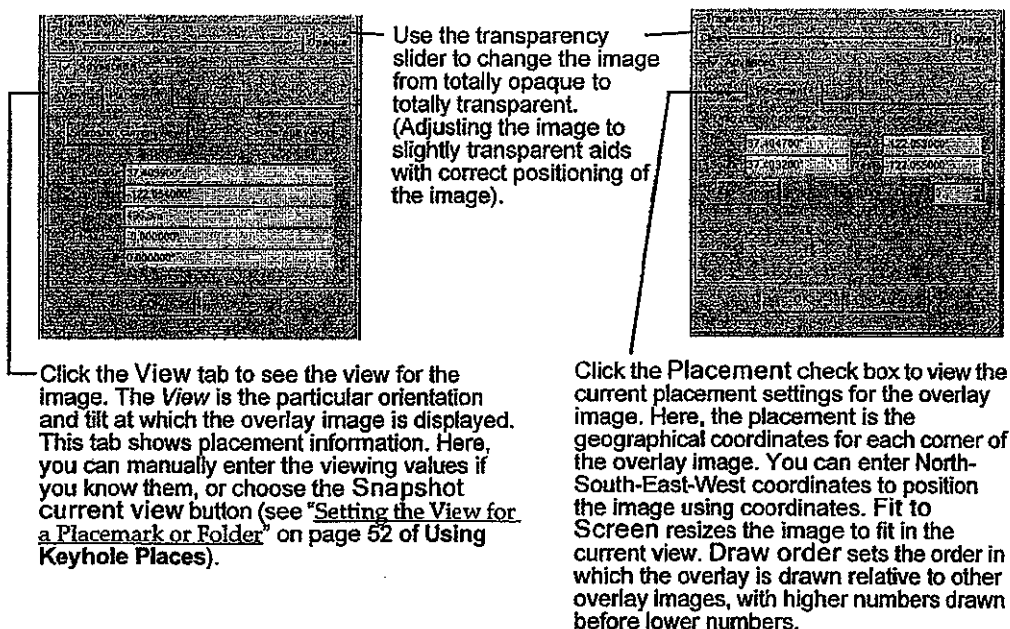
Table 1: Positioning Overlay Images in the Viewer

Effect	Action
Move the image without resizing	Click on the center cross hair to move the entire image, without resizing it, to another position in the view. The cursor changes to a hand to indicate that the "move" mode is active.
Reposition the view with the image	Click anywhere in the viewer except on one of the markers. Drag to reposition the view. The cursor is an arrow, indicating that you can reposition the view without changing the position of the image.
Scale the image from one side	Click and drag a side anchor. The cursor changes to a horizontal double-arrow to indicate selection of a side anchor.
Scale the image from one corner	Click and drag a corner anchor. This scales the image from the specific corner you drag. The cursor change to a diagonal double-arrow to indicate selection of a side anchor.
Scale the image from the center	Hold the shift key, click on any anchor point and drag. This scales the image from the center, maintaining the original aspect ratio of the image.
Rotate the image	Click on the diamond shaped handle on the right side of the image, hold and rotate. You can rotate the image either clockwise, or counter-clockwise.

Tip: Try positioning the center of the image as a reference point, and then use Shift + anchors to stretch the image for best positioning.

You can also select the Advanced check box to modify the placement and view information for the overlay. **Figure 1** below illustrates and describes these features.

Figure 1: Overlay Edit Features



Saving the Overlay

Once you have the image positioned and adjusted to your liking, follow these steps to save the overlay.

1. Make sure that your overlay placemark is saved in the My Places folder or in a sub-directory of the My Places folder.
Any overlay placemark located outside this directory is cleared away when you exit the Keyhole client.

2. Click OK in the Edit Imager Overlay dialog to save your changes.
The overlay is saved in the My Places folder. You can access this overlay any time by double-clicking on it, just as you would with a placemark.

Note: An overlay is a combination of a placemark entry in the Keyhole client along with the image associated with the overlay. The placemark entry references the location of the image used for the overlay. You can select an image for an overlay located anywhere on your computer's hard drive; however, if you move or rename the image after creating the overlay, the image will not appear the next time you visit the overlay (after closing and restarting the Keyhole client).

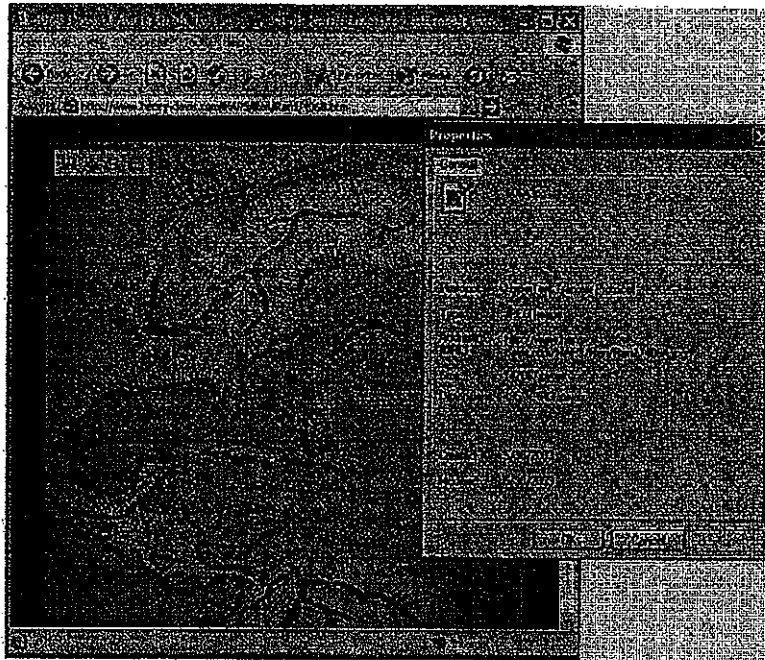
Creating an Overlay with a Web Image

You can create an overlay using an image on the World Wide Web rather than one stored on your computer. To do this, type in the URL of the image in the Image File/URL input field of the Edit Image Overlay dialog as shown above in **Figure 1**.

Edit the rest of the information for the overlay as described above in "Creating an Overlay from a Local Image" on page 90.

The rest of this section covers how to find the location string for an image that is stored on the World Wide Web.

1. Using your web browser, find the image on the web that you want to reference. This image must be in one of the following formats:
 - JPG
 - PNG
 - BMP
 - TIFF
2. Right-click on the image and choose Properties to get the exact address (URL) for that image. Select the URL and copy it (Ctrl-C).



Important: Do not copy an HTML file location. You must find the address of the *image*, not the HTML file that references it.

3. Return to the Edit dialog in the Keyhole client and copy (Ctrl-v) or type in the URL of the web image in the Image field of the Edit dialog.



Continue editing the position and size of the overlay image as described in "Positioning the Image" on page 93.

Viewing Overlays

In addition to the overlays you create, you can also view overlays that others have created, either ones that have been emailed to you (local overlays), or overlays posted on the Keyhole BBS by other Keyhole users. In addition, overlays can reference images available on any web server, as described above.

Viewing a Local Overlay

Follow these steps to view overlays that others have emailed to you.

1. Save both the overlay and the associated image file to your a folder on your computer.

Make sure that both the overlay and the associated image file are located in the same directory.

Note: Keyhole client version 2.0 and higher supports both ETA and KML file format for overlays.

2. From the My Keyhole tab, click on Open.
3. Open the overlay file.

The overlay appears in the viewer. The associated image is retrieved in one of two ways:

- A local image file associated with the overlay is opened.
- The associated image file is downloaded from the web or network if the overlay was created using an image on the web. In this way, real-time (or

near real-time) images can be pulled into the viewer (such as weather satellite images).

Note: If the overlay image is not found, you will see a small white square with the words "Image Not Found" in place of the overlay image. You can right-click on the overlay and enter the correct location of the image if it is a URL, or click on the Browse button to location the image on your computer or network drive.

Once you have opened an overlay in the Keyhole client, you can adjust its position and appearance like you would an overlay that you create. To do this, right-click on the overlay entry in the My Keyhole tab. Select Edit... from the pop-up menu to view the Edit Overlay dialog for the overlay. See [Figure 1](#) for the description of adjustments you can make to an overlay image with the Edit Overlay dialog.

Viewing a Posted Overlay

Follow these steps to view an overlay posted to the Keyhole Community BBS or other website or network directory.

1. Navigate to the posting that contains the overlay you want to view.
2. Click on the link to the overlay file.
3. A File Download dialog prompts you to either Open or Save the file.
 - **Choose Open to send the file directly to the Keyhole client and view it.**
 - **Choose Save to save the file to your computer.** You can then click the Open button in the My Keyhole tab to view the file.

Tip: If you want to reference the posted overlay link later on without having to download the file again, move the overlay entry into the My Places folder in the My Keyhole tab.

Once you have opened an overlay in the Keyhole client, you can adjust its position and appearance like you would an overlay that you create. Simply right-click on the overlay entry in the My Keyhole listing and select Edit... from the pop-up menu. See [Figure 1](#) for the description of adjustments you can make to an overlay image with the Edit Overlay dialog.

Hiding and Deleting an Overlay

If an overlay is in your My Keyhole list and you want to hide it, you can clear the check box next to it. This turns off the overlay of the current view.

If you are finished with a particular overlay, you can delete it by right-clicking on the entry and selecting Delete from the pop-up menu.

Emailing an Overlay

You can email overlays that you have created to other Keyhole users in one of two ways:

- **Right-click on the overlay entry and select Email... from the pop-up menu**
Choose Email Placemark from the pop-up menu. If the overlay is created from an image stored on the World Wide Web, simply fill in the appropriate fields in the email and send the included placemark file.

If the overlay you are sending is created from an image stored on your computer, you must also include that image as an attachment so that the recipient can see the placemark with the correct image. The overlay file will not work without its associated image.

- **Save the selected overlay as a KML file**
Do this by right-clicking on the overlay entry and selecting Save... from the pop-up menu. Use the dialog that appears to indicate where to save the file, and click Save. To email an overlay created with a local image file, attach *both* the overlay file (KML format) and its associated image file as an email attachment in your mail program and send both.

You can later email the placemark and overlay files to another Keyhole client user, or you can share your placemark files with other members of the Keyhole community by posting them to the Keyhole bulletin board (see ["Posting Overlay Data to a Shared Web Server"](#) below).

Important: Only people who already have the Keyhole client version 2.0 or higher can view overlay files you create.

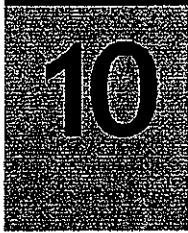
Posting Overlay Data to a Shared Web Server

You can share overlay data with other Keyhole client users by posting the placemark and overlay data to a web server that other users also have access to. Keyhole EC users can create a web server to host shared overlay/placemark information. Other Keyhole users can post overlays and placemark information to the Keyhole

Community BBS. The rest of this section covers the details of posting overlay data to the Keyhole BBS.

You can post placemarks that reference overlays to the Keyhole Community BBS only if they reference images that are already stored on the World Wide Web. Overlays that reference your local images will fail to load.

1. Follow the instructions described in "Emailing an Overlay" above to save your overlay placemark as a KML file.
2. Use a web browser to connect to bbs.keyhole.com.
You must be a registered user of the Keyhole Community to post overlay files. If you are a first-time user of the Keyhole software, you must first register with the Keyhole community before you can login and post placemark files. This registration is a separate process from your Keyhole subscription and is free of charge.
 - a. Go to <http://bbs.keyhole.com> and click on the registration link in the login area.
 - b. Follow the on-screen instructions to register on the site.
 - c. You will need to provide your email address in order to activate your account. After registering, an email will be sent to that address containing your registration information and an activation link.
 - d. Click on the link provided in your account activation email.
 - e. Your bulletin board account is activated, and you have full access to all of the features of the Keyhole BBS.
3. Log into the Keyhole Community website.
4. Choose a Forum (threaded discussion) in the Overlay grouping of forums such as User Favorites.
5. Click the Post link in the forum subheader.
6. Enter information in the Subject and Post fields, select the check box next to I want to preview my post and/or attach a file, and click the Continue button.
7. Preview your posting and attach an overlay file by clicking on the Browser button and navigating to the file.
8. Click the Continue button to post your message and file.



Keyhole Support

The Keyhole client allows users a number of ways to answer questions and resolve issues with the application.

Help

Clicking on the FAQ option of the Help menu of the Keyhole client connects you to the FAQ area of the Keyhole Support website:

www.keyhole.com/support/

Customer Support

Keyhole subscribers are entitled to the following support options:

Online Support

Keyhole, Corp. has assembled a database of common customer issues as a resource for clients to resolve their issues on their own. Go to:

www.keyhole.com/support/

Email

Subscribers who cannot resolve their support issues from reading the manual or the online support database should contact support via the Keyhole website.

www.keyhole.com/support/

Telephone

Telephone support is offered to Keyhole PRO and Keyhole EC users only (650.625.9400).

Sales or Business Development

Sales or business development inquiries should be directed to 650.625.9400.

11

Keyhole Imagery

This document covers information about the images you see in the Keyhole client viewer—namely high-resolution printing, overlay editing, viewer imagery, and resolution.

High-Resolution Printing

To produce the highest quality prints capable with the Keyhole software, follow the steps below.

Note: In order to print high-resolution prints, your computer will need a minimum of 256MB of RAM.

1. Maximize the image size by closing the peripheral windows in the Keyhole workspace.
2. Position the viewer to cover the area you want to print.
3. Zoom the view out to a slightly higher altitude. (This improves the data quality of the image.)
4. Select Print from the File menu.
5. In the Print dialog, select the resolution quality of the image—Low, Medium, or High.

A dialog appears as the Keyhole software prepares the image for printing.

Note: If you have purchased the Premium Printing module for Keyhole Pro or if you are a Keyhole EC user, you can print higher resolution images—up to 3000 pixels. Simply select Premium Printing as the printing resolution.

6. When the printer dialog box appears, choose the destination printer and click the Preferences (or Properties) button.

7. Assign the minimum required printing properties (necessary for the best resolution) as follows:
 - 11x17 paper size
 - Landscape orientation
 - Minimum 300 DPI
8. Click OK and print.

Tip: Do not tilt the perspective more than 30 degrees when printing. Doing so forces the assembly of data for hundreds of miles, effectively stalling application performance.

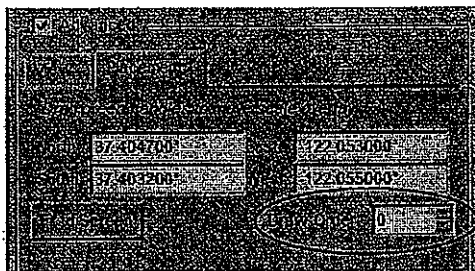
Advanced Overlay Editing

Keyhole Pro/EC users can use the following advanced techniques when creating overlays:

- Viewing and ordering multiple overlays simultaneously
- Creating transparent regions in overlay images

Using Multiple Overlays

Overlays function in a similar manner to regular places, except that the marked location also includes its associated overlay image. You can use multiple overlays for a given view when you want to display successive overlay images, such as with a phased project design. In such a situation, you can also set the display order of the overlapping images. Use the Draw Order option of the overlay Edit dialog to set this property, as shown below.



By default, the draw order of an overlay is set to zero. If you think of zero as "ground level," then higher values are drawn on top of lower values. For example, if you have an overlay called *Phase 2* and you want it to appear beneath an overlay called *Phase 1*, set the draw order of *Phase 2* to 0 and the draw order of *Phase 1* to 1. In this way, you

can display underlying illustrations by turning off overlying ones. Or, if you have two images whose boundaries overlap each other, you can use the draw order to indicate which image should appear when viewed from the top down.

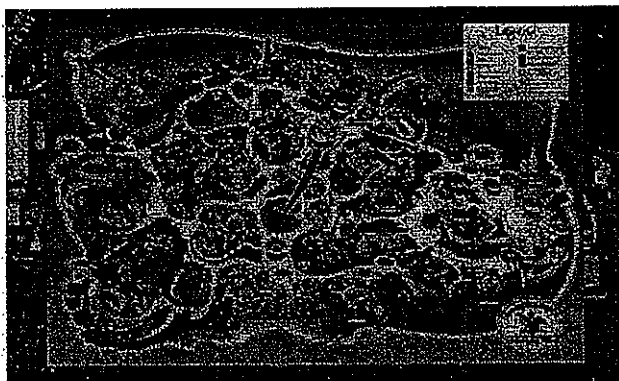
Creating Transparent Overlays

You can use a photo editing tool such as Adobe® Photoshop® to edit images in PNG format so that certain areas of the image are transparent when imported into the Keyhole client viewer. This is useful when the overlay image contains data that would otherwise obscure underlying imagery in the viewer, such as a rotated image with a black background.

This section offers a very brief example of the steps taken in Photoshop to create an image with transparent edges. It is not meant to be an exhaustive tutorial in Photoshop. In particular, accurately selecting parts of an image in Photoshop can be done in a variety of ways and with mixed results, depending upon the type of image you are working with as well as your familiarity with Photoshop.

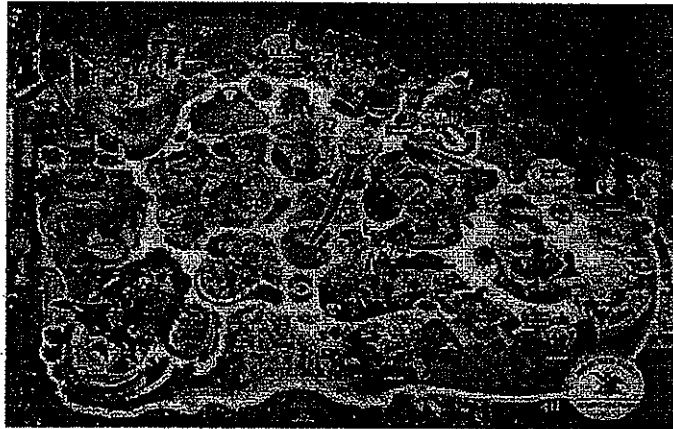
In this example, a map of Sea World in San Diego is used as an overlay in the Keyhole client viewer. In this first view, the legend and blue background of the map obscures the underlying imagery of the viewer.

Figure 1: Overlay Image with Obscuring Background



By editing the original overlay image and saving it as a 24-bit PNG file with transparency on, the overlay appears with only the relevant imagery visible in the viewer.

Figure 2: Overlay Image with Transparent Background



Creating Transparent Images

The following steps show the basic process for creating transparent images in Photoshop. A familiarity with Photoshop editing is assumed. Keep in mind that the key part of this process involves *selecting* part of the image that is not wanted. Selection in Photoshop can be done in a variety of ways, and with varying results. You can consult the Photoshop documentation to learn selection methods in detail.

1. Open the image in Photoshop and copy the main layer, which should be labeled *Background*.
2. Make sure that the image is set to RGB color and is not an indexed image. If the image is indexed, change it to RGB by selecting Image - Mode - RGB color from the menu.
3. Move the original background layer to the trash.
You should now have one layer that is a copy of the background layer. This step is necessary for creating transparent images!
4. Use the crop tool to crop the image as much as possible.
This simplifies the process of selecting the background, and it also decreases the pixel size of the overlay image, thereby eliminating extraneous information from the overlay image and improving the Keyhole client performance when loading the overlay.
5. Select the region that you want to make transparent.
As stated before, there are a number of ways to select regions in source imagery. You can use the magic wand tool, the lasso tool, the polygon lasso

tool, or the magnetic lasso tool. You can also select based on a specific color in the image. See [“Tips for Selecting Imagery Regions”](#) below for more information. You may have to make repeated selection attempts before getting all of the region selected correctly.

6. Remove the selected region by pressing the Delete button on your keyboard. You can also repeat both [Step 5](#) and this step until all desired regions are removed.
7. Select Save for Web from the File menu.
8. In the Save dialog, select PNG-24 from the Settings drop-down menu and make sure the Transparency check box is selected.
With the Transparency option selected, a checkerboard pattern appears in the transparent areas of the image.
9. Save the image and import it into the Keyhole client as described in [“Using Custom Imagery In Keyhole”](#) on page 89.

Tips for Selecting Imagery Regions

The following are some general tips for selecting imagery regions in Photoshop.

- **Zoom in to your image!**

In general, good selection involves a close examination of the image at the pixel level. You will attain a more precise selection if you zoom into the region before making the selection. It is easier to see the distinction between color boundaries when zoomed in.

- **Use the magic wand to select targeted color areas.**

The magic wand is best for single-color or flat-color regions. When using the magic wand, experiment with the Tolerance value. A higher tolerance selects a wider range of pixel colors from the one you have selected, and a lower tolerance selects pixels closer to the color you have clicked on.

Select the Contiguous option when you only want to select adjacent regions. Clear the Contiguous option when you want to select all regions of the same color value in the entire image.

- **Use the lasso tool to select contiguous boundaries.**

The lasso tool has three types—free form lasso, polygon lasso, and magnetic lasso. You can read about how to use these in the Photoshop online help. Using the lasso tool is much easier when zoomed into the image.

- Use Quick Mask mode to verify your selection.

When you turn on Quick Mask mode, you will see the non-selected regions in red. This is a helpful visual aid to determining the precision of your selection.

Saving Keyhole Imagery to Your Computer

You can save the image of your current view to your computer's hard drive for later use. The image is saved in JPG format. Follow the steps below.

1. Select Save Image from the File menu, or type Ctrl+S.
A Generating Image dialog appears, followed by a file dialog box when the image has been generated.
2. Use the dialog box to navigate to the place where you want to save your file, name the file and click OK.

Alternatively, you can use the Copy View feature under the Edit menu to copy the current view to your computer's clipboard. Using an image editor such as Microsoft Paint or Adobe Photoshop, you can paste the image into an open file. As with the Save Image option, the image is saved in JPG format.

Data Resolution

Data resolution is used to describe what can be identified in an image that you see in the Keyhole client. For instance, one-meter resolution means that one picture unit (or pixel) on your screen represents one square meter area in real life. In a one-meter resolution image (see example below), objects that are one-meter in size on the ground can be distinguished. For instance, objects such as swimming pools, tennis courts, cars, trucks, and boats can be easily detected. One-meter imagery does not allow you to see individual people, but some smaller objects, such as white stripes in streets and parking lots are visible due to sharp contrast against the black asphalt.

In addition to data resolution, a number of other factors affect the quality of imagery in the viewer at any given time. If you are experiencing blurry images in your viewer, this section might help you resolve your problem. This section covers:

- Base Resolution
- Bandwidth
- Memory
- Offline Use

Base Resolution

The Keyhole client seamlessly combines data with different resolutions to provide users the smooth experience of zooming in and out. However, you can only zoom in to the level of detail allowed by the data. If you zoom closer than the base resolution, the viewer enlarges or resamples pixels, thus producing blurry pictures.

Keyhole, Inc. provides high-resolution data (1 meter or better) for over 80 major metropolitan areas, 15-meter resolution data through out the United States, and 1-kilometer data for the entire world. Better resolution data, new cities, and more layers of information are constantly being added. If your area is still missing from our database, please contact Keyhole's business development for more information on availability and pricing for particular areas.

The following images show three different resolutions and the level of detail that you can reasonably expect from them.

Figure 3: 3-inch Resolution, San Diego

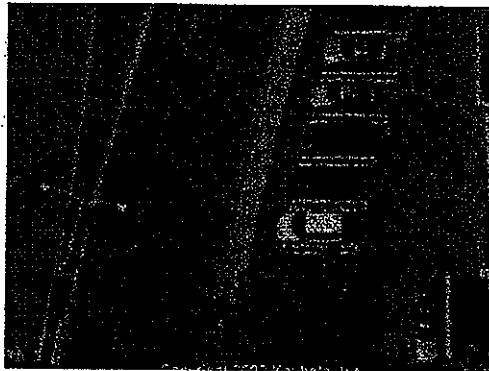


Figure 4: One-meter Resolution, Sacramento



Figure 5: 15-meter Resolution, Jackson, MS



Bandwidth

Basic line speed, quality of connection, and local network traffic all have an impact on how much data can be delivered to your computer. In order for Keyhole to effectively sharpen areas as you fly, it requires that your effective network speed be *at least* 128 kbps. If your internet service is either ISDN, DSL, or cable modem, then your network speed meets or exceeds the minimum recommended bandwidth.

Slower connections take longer to sharpen up the image to its highest resolution. For this reason, users with lower bandwidth connections (56K dial-up modem or lower), can use Keyhole HTML™, which accesses the exact same database as Keyhole and delivers image to any computer with any operating system, graphics card, and Internet connection. This interface allows access from Macintosh, Unix/Linux, and other platforms, including handheld/wireless devices such as PDA's and phones.

Memory

The amount of memory in your computer also impacts the ability of the Keyhole client to sharpen images as you move from point to point. The Keyhole client requires 128MB of main memory. The more memory a machine has, the faster the Keyhole client runs. The Keyhole client requires a graphics card with at least 16B of memory (or an Intel adaptor that shares at least 16MB of main memory). Machines with less main memory or with graphics cards with less memory might run the Keyhole client slowly, or not at all. New graphics cards with 32 MB of memory, which deliver stunning performance with the Keyhole client, are available for less than \$100. See "[3D Rendering Software](#)" on page 114 of **Keyhole Performance** for a list of recommended graphics cards.

Offline Viewing

If the network connection between your computer and the Keyhole Server is broken or has been temporarily terminated, you will notice that you can still view certain areas you have visited before, but new areas are unavailable. This is because the Keyhole client automatically *caches*, or saves, previously viewed areas on your disk. Check your network connection (open up a standard web browser) to make sure you still have an Internet connection are not working offline.

112



Keyhole 2

Keyhole Imagery

12

Keyhole Performance

This document covers in more detail some of the ways you can improve the performance of the Keyhole software on your computer. The following topics are covered:

- Graphics Cards
- Improving 3D Viewer Imagery
- Configuring Memory Usage

Graphics Cards

This section covers the most common performance issues related to graphics cards. Because the Keyhole client is a graphics-intensive application, you can get the most out of Keyhole and your graphics card by using the following information.

Graphics Card Drivers

Approximately 70% of all Keyhole performance issues are addressed by upgrading to the latest available graphics driver.

If you have a laptop computer, you can download the latest driver from the computer manufacturer's web site.

If you have a desktop computer, download the driver from the graphics card manufacturer's web site. While this should resolve most problems you encounter with the Keyhole client, you might experience conflicts with other software on your computer.

Chances are, your video card uses technology from NVIDIA, ATI, or Intel. Driver downloads are available at:

- www.nvidia.com
- www.ati.com
- www.intel.com

The following steps illustrate how you can update the graphics card driver for your computer.

Note: These instructions are specific to the Windows XP operating system, but also apply with some variation to other Windows operating systems.

1. Right-click on the computer's icon and choose Properties.
2. Expand the Display Adaptors icon, right-click on the icon that represents your graphics card, and select Properties.
3. You can troubleshoot your graphics card under the Generals tab, and you can update your driver by clicking on the Drivers tab and choosing the appropriate option in that panel.

Note: Be sure to reset your screen resolution to at least 1024x768, and your color bit to High Color (32 bit) or True Color (16 bits) after the upgrade. See below for instructions.

For the latest information on graphics card compatibility and graphics card drivers, see the Support section of the Keyhole website (www.keyhole.com/support).

Graphics Card Memory

If your graphics card has only 8MB of memory on it, set your monitor's resolution to 1024 x 768 pixels and make sure the color is set to High Color (16 bit) or True Color (32 bit). Do this by clicking on the desktop and choosing Properties. Choose the Settings tab in the Display Properties window and select the correct resolution and color depth in the Colors section.

3D Rendering Software

Most graphic-intensive computer applications—including the Keyhole client—rely upon one of two possible 3D rendering capabilities on your machine: either OpenGL or Direct X. Because OpenGL is the rendering software for most graphics cards, the Keyhole client uses that mode by default. However, your system may require Direct X in order to best operate the Keyhole client. When you start the Keyhole client, you can select the rendering of Keyhole imagery best suited to your system hardware.

There are two ways to choose either OpenGL or Direct X as your 3D graphics rendering software.

- Select Set DirectX as the Default Render from Programs - Keyhole under the Start menu of your computer for Direct X rendering, or choose Set OpenGL... for OpenGL rendering. After specifying this mode, the next time you start the Keyhole client, that mode will be used.

- Select OpenGL or DirectX from the Rendering section of the Preferences dialog. To open the Preferences dialog, select Preferences from the Edit menu and make sure the View tab is active.

Improving 3D Viewer Imagery

The following are modifications that you can make to the Keyhole software in the View tab of the Preferences panel to improve the appearance of imagery in the 3D viewer. Keep in mind that these enhancements affect the performance of your Keyhole software. That is, the more enhancements, the more system or GPU memory required.

To modify these settings, choose Preferences from the Edit menu and select the View tab.

Detail Area

The Detail Area determines the amount of the Viewer window that is in focus. To optimize performance for the majority of PCs, medium is set as the default. Large is recommended only for PCs with a minimum 32 MB of *graphics card* memory.

Texture Colors

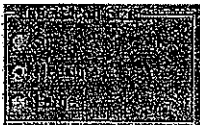
Modify this feature to set the number of bits used to represent colors in the viewer. True Color (32 bit) produces a more realistic view.

Anisotropic Filtering

Anisotropic filtering is a method used to filter pixels in texture mapping in order to produce a smoother looking image. Enabling this feature produces a much smoother image around the horizon when viewing the earth from a tilted angle. It is also requires more graphics card memory, so use this option only if your graphics card has at least 32 MB of memory.

Label and Icon Size

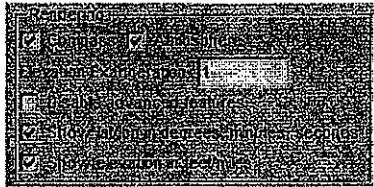
You can set the default size for labels and icons in the 3D viewer.



The small setting is optimal for detailed urban areas, but if you also typically look at a mixture of large and urban areas, the medium setting is the best choice.

Rendering

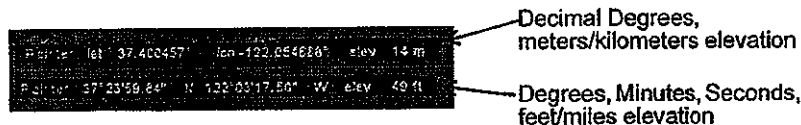
The rendering area contains the following settings that you can customize:



- **Compass View**
To turn on or the display of the compass in the 3D viewer
- **Atmosphere**
When you are zoomed out enough from the globe to view the horizon from space, you can see the atmosphere around the globe when this option is set.
- **Elevation Exaggeration**
To adjust the appearance of hills when you have terrain turned on in the viewer, you can set the Elevation Exaggeration value from 1.0 to 3.0, including decimals.
- **Disable advanced features**
Use this troubleshooting feature when you notice problems with the Keyhole client 3D viewer. This option turns off such advanced rendering features as mipmap texture rendering and filled polygons, thereby reducing the amount of work for your graphics cards. If the problem is resolved after turning on this feature, the problem is likely due to your graphics card or graphics card driver. See "[Graphics Cards](#)" on page 113 for more information.

- **Show lat/lon in degrees, minutes, seconds**

When this option is checked, the status bar at the bottom of the 3D viewer displays latitude and longitude in degrees, minutes, seconds notation rather than in the default decimal degree notation.



- **Show elevation in feet/miles**

When this option is selected, the pointer elevation is displayed in feet/miles units rather than the default meters/kilometers.

Fonts

You can set the primary and secondary fonts for displaying label information in the 3D viewer. Use this feature if your data has characters in it that are not available in the default font of Arial. The Keyhole client first attempts to match a character from the font specified as the primary font. If no match is found, the Keyhole client attempts to match the font specified as the secondary font.

Configuring Memory Usage

The Cache tab in the Preferences panel provides options that you can use to modify the memory requirement settings for your Keyhole client. This section covers those features.

Memory Cache Size

This feature determines how much uncompressed data is stored in the computer's main memory (RAM) so that the Keyhole software doesn't have to retrieve the images from the hard drive. By using stored, or *cached* data, the viewer can display previously viewed images much faster. The suggested number for this setting is 1/2 of your computer's available RAM.

If you are experiencing some difficulties with your Keyhole client such as slow data or other anomalies, you can click on the Clear Memory Cache button. This will clear

the computer's cache of data it has stored from your recent usage, and could possibly resolve a slow performance issue.

Disk Cache Size

In a manner similar to memory cache, the disk cache feature determines how much compressed data is stored on the local hard drive so that the Keyhole software doesn't have to go to the network to get the image. The end result is that the images will load more quickly. However, this feature only works well if you are viewing areas that you have previously viewed. After you cache is full, older data is pushed out to accommodate newer data.

You can assign up to 2 GB to the Keyhole client. Assign as much disk space for caching as you have available on your hard drive and are willing to provide to the application.

Tip: You can click on the Clear Disk Cache button to flush the old data out of storage. This often resolves performance issues or other anomalies you might experience with your software.

13

Keyhole Premium Features

Keyhole Pro users have the option of purchasing a number of premium features for the Keyhole client. This chapter describes the following premium features:

- Premium Printing
- Importing and Viewing GIS Data
- Recording Movies Using the Keyhole Client

Premium Printing

If you have purchased the premium printing module for the Keyhole client, you can print high resolution imagery up to 3000 pixels. See "High-Resolution Printing" on page 103 of *Keyhole Imagery* for instructions on how to print using the premium printing module.

Importing and Viewing GIS Data

If your organization provides GIS-related data specific to your industry needs, you can import that data directly into the Keyhole client viewer using the GIS import module of the Keyhole client. The Keyhole client supports two main types of GIS data—GIS vector data, and GIS imagery data.

Note: This feature is available to Keyhole EC users, or as an additional module for Keyhole PRO users.

Importing GIS Vector Data

You can open GIS vector-based files in the Keyhole client and view the resultant vector data in the viewer. Types of supported vector data include:

- Points
- Lines and poly lines
- Polygons, including filled polygons